State of Idaho
# INEEL Oversight Program

# 2003 Environmental Surveillance Report

**A compilation and explanation of data collected by the INEEL Oversight Program during 2003**


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# *Executive Summary*

# *INEEL OP Environmental Surveillance Program 2003 Results*

## Results Summary

The Idaho National Engineering and Environmental Laboratory Oversight Program (INEEL OP) Environmental Surveillance Program (ESP) operates an extensive monitoring network to measure the condition of air, water, and external radiation in and around the boundaries of the INEEL operated by the U.S. Department of Energy (DOE). This network also measures terrestrial impacts of the INEEL via the sampling of soil and milk in the region.

After completing an independent assessment of the environmental conditions during 2003 in the vicinity of the INEEL, the INEEL OP, which is a division of the state of Idaho's Department of Environmental Quality, concluded:

- No offsite environmental impacts from INEEL operations were evident as a result of environmental air, radiation, soil, and milk monitoring conducted by the INEEL OP.

- No contamination attributable to the INEEL was identified in water samples collected at distant or Magic Valley monitoring sites, however, INEEL impacts can be identified at some sites along the southern boundary of the INEEL. Tritium concentrations at these sites were greater than background but less than 1 percent of drinking water standard. Chromium at these sites also exceeded background but was less than 5 percent of the drinking water standard.

- Analytical data reported by surveillance programs of the INEEL OP and DOE generally agree.

The following provides additional summary information concerning the major findings of each component of the INEEL OP monitoring network.

# Air Monitoring Major Findings:

Air samples collected by the INEEL OP in 2003 were screened for gross alpha and gross beta radioactivity, gamma radioactivity, and analyzed for tritium contained in atmospheric moisture. Radiochemical analyses were performed on composited air filters for strontium-90, plutonium-238 and -239/240, and americium-241.

Gross alpha and gross beta screening measurements of particulate air filters were consistent with historical background concentrations. Elevated concentrations were observed during periods associated with temperature inversions. Atmospheric tritium and tritium concentrations in precipitation samples collected at boundary and distant monitoring locations were consistent with the range of historical background concentrations observed by INEEL OP and typically below detection levels.

- No offsite environmental impacts from INEEL operations were evident based on the results of particulate air sampling.

- Strontium-90, americium-241, plutonium-238, and plutonium 239/240 were measured at several monitoring locations. Concentrations were slightly greater than the laboratory's detection capability, yet were significantly below the INEEL OP action levels which are 10% of the limits established by the Clean Air Act. Measurable quantities of these radionuclides are expected in the environment due to historic above ground testing of nuclear weapons.

- No radioactive iodine was detected in air.

- No radioisotopes from INEEL operations were detected in precipitation samples.

- Tritium was measured in atmospheric moisture samples collected at several onsite monitoring locations. Concentrations were slightly greater than the laboratory's detection capability, yet were significantly below the INEEL OP action level.

- Comparisons of INEEL OP air monitoring results with DOE program results show relatively good agreement.

# Terrestrial Monitoring Major Findings:

Terrestrial environmental surveillance typically includes examination of several mechanisms that tend to collect and/or accumulate radioactive material in the environment. Such mechanisms are monitored through the sampling of milk and soil in and around the INEEL. Additionally, the INEEL OP conducts *in-situ* soil measurements on and around the INEEL for selected naturally occurring and man-made, gamma-emitting radionuclides. The locations for soil and milk sampling reflect the consideration of potential source terms, their significance, regional meteorology, and monitoring activities by other programs.

Gamma spectroscopic analysis of milk samples collected during 2003 and *in-situ* gamma spectroscopic measurements for radionuclide concentrations in soil were performed throughout 2003. INEEL OP observed no man-made radionuclides in milk samples collected during 2003, specifically iodine-131 ($^{131}$I). Cesium-137 ($^{137}$Cs) concentrations observed in soil on and around the INEEL were consistent with historical measurements and within expected background concentrations attributable to historical atmospheric nuclear weapons testing.

- No offsite environmental impacts resulting from INEEL operations were indicated as a result of the analyses of milk or soil samples.

- Comparisons of INEEL OP terrestrial monitoring results with DOE program results show good agreement.

## Water Monitoring Major Findings:

Water monitoring is conducted on or around the INEEL for the primary purpose of examining trends of key INEEL contaminants and other general ground water quality indicators. Water monitoring is also conducted at select verification sites and sampled for the primary purpose of verifying DOE monitoring results for selected facilities. Included within the program are targeted groundwater and surface water locations on and near the INEEL, and selected wastewater sites for INEEL facilities. All water monitoring activities are conducted with other organization including the USGS, ESER, BBWI, NRF, and ANL-W.

- Gross beta radioactivity, tritium, strontium-90, and chromium concentrations exceeded EPA drinking water standards in the Eastern Snake River Plain Aquifer beneath several facilities at the INEEL. Contaminant concentrations generally decreased or remained constant through 2003.

- Drinking water standards were not exceeded at any sites where water is used by the public or INEEL workers.

- No contamination attributable to the INEEL was identified in water samples collected at distant or Magic Valley monitoring sites, however, INEEL impacts can be identified at some sites along the southern boundary of the INEEL. Tritium concentrations at these sites were greater than background but less than 1 percent of drinking water standard. Chromium at these sites also exceeded background but was less than 5 percent of the drinking water standard.

- In 2003, the INEEL OP collected replicate groundwater, surface water and wastewater samples with the DOE's primary contractors. Results reported by INEEL OP were generally in close agreement to those reported by USGS, ESER, BBWI, ANL-W, and NRF for most analytes.

# Radiation Monitoring Major Findings:

The INEEL OP uses a combination of instruments that measure the environmental radiation levels from natural cosmic and terrestrial sources as well as from possible contributions from operations at the INEEL. Electret Ion Chambers (EIC) are deployed at radiation monitoring stations to measure cumulative exposure to penetrating radiation in milliRoentgens (mR) during each calendar quarter. The EICs are deployed at 91 monitoring locations on the INEEL, near the INEEL boundary, and at distant locations. In addition, INEEL OP uses high-pressure ion chambers (HPICs) to continuously measure the gamma radiation exposure rate in microRoentgens per hour (μR/hr) at 11 fixed monitoring sites around the INEEL. The data collected by the HPICs at these sites are transmitted electronically to the INEEL OP staff for "real-time" assessment.

Ambient penetrating exposure measurements performed during 2003 were consistent with historical background measurements. Redundancy in data collection and use of passive radiation detectors provided adequate cumulative average exposure rates at each radiation monitoring location.

- No offsite environmental impacts from INEEL operations were detected with environmental ambient gamma radiation exposure-rate measurements.

- Comparisons of INEEL OP radiation monitoring results with DOE program results show relatively good agreement.

# Quality Assurance for the ESP

The Quality Assurance Program for the INEEL OP ESP defines the procedures that will ensure the quality and integrity of samples collected, the precision and accuracy of the analytical results, and the representativeness and completeness of environmental measurements taken. All analyses and quality control (QC) measures in the analytical laboratories were performed in accordance with approved written procedures maintained by each respective analytical laboratory. Sample collection was performed in accordance with written procedures maintained by the INEEL OP.

- No issues involving sample chain of custody, sample holding times, analyses of blank, duplicate, and spiked samples were observed during the calendar year 2003. Methodologies and data reports issued by the contracting laboratories conformed to the requirements of the INEEL OP.

- One significant quality assurance issue was identified during the fourth quarter of 2003. ISU-EML identified twelve groundwater samples that were affected by problems exhibited by a liquid scintillation counter for the technetium-99 analysis. The resultant concentrations for these samples exceeded the MDC in all 12 samples, which included samples from wells that had no prior history of technetium-99 contamination. The laboratory hypothesized that the problem was caused by an interaction between minerals in the sample water and the

liquid scintillation fluid used. Once a new fluid was employed by the laboratory, the technetium-99 analyses have been performed within quality control parameters.

- All data have been verified and deemed complete, meeting the requirements and data quality objectives established by the INEEL OP.

## INEEL OP Mission

The mission of the state of Idaho's INEEL OP is to provide the people of Idaho with independent, factual information about the INEEL, to help ensure the safety of the citizens of Idaho through the protection of public health and the environment, and to provide statewide radiological expertise. In partial fulfillment of this mission, the INEEL OP developed an Environmental Surveillance Program with the following objectives:

- Maintain an independent environmental surveillance program designed to verify and supplement DOE surveillance programs.

- Provide the citizens of Idaho with information that has been independently evaluated to enable them to reach informed conclusions regarding the potential impacts of present and future DOE activities to public health and the environment in Idaho.

Data from the environmental surveillance efforts outlined above are interpreted and reported by the INEEL OP on a quarterly and annual basis and are used to measure the impacts of DOE facility operations on the public and the environment. The INEEL OP's independent findings are also used to compare with data reported by DOE surveillance programs.

The most recent annual Environmental Surveillance Report documents the 2003 findings, identifies discernable trends, and presents the conclusion of the comparability of the data reported by the INEEL OP and the various DOE monitoring programs. The body of the report is used to scientifically evaluate information on potential INEEL impacts to the public and environment and independently report conclusions to the people of Idaho.

The 2003 ESP Quarterly Data Reports include the most recent data collected but provide little discussion or interpretation of the data. These reports can be found online at:

http://www.oversight.state.id.us/ov_library/index.cfm#qdr

The state of Idaho and collaborating organizations will continue monitoring conditions at and near the INEEL to assess potential impacts on public health and the environment.